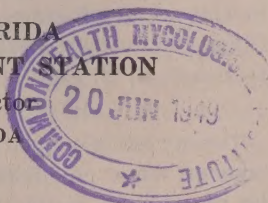


UNIVERSITY OF FLORIDA
AGRICULTURAL EXPERIMENT STATIONHAROLD MOWRY, Director
GAINESVILLE, FLORIDA

CONTROL DOWNY MILDEW OF CABBAGE WITH SPERGON

By A. H. EDDINS

Plant Pathologist, Potato Investigations Laboratory

Downy mildew, caused by the fungus *Peronospora parasitica* (P.) Fr., attacks cabbage in all stages of growth but causes most damage in plant beds. When conditions are favorable for its development the disease kills or stunts the growth of young seedlings before they have grown large enough for setting in the field. Collards, cauliflower, broccoli, brussels sprouts and kohlrabi also are susceptible to mildew, but it is most important on cabbage because that crop is grown more extensively in Florida than any of the other crucifers.

The disease may be initiated by resting spores of the fungus which live over the summer in fields where mildew was present the preceding year. Primary infection develops when a resting spore in contact with the hypocotyl or stem of a young cabbage seedling germinates and attacks it. From this point the fungus grows into the seedling and produces spores on the surface of the seed leaves and stem. These spores are scattered mostly by the wind and rain, and those which land on leaves of healthy plants germinate and infect them, resulting in rapid spread of the disease throughout the plant bed. Serious outbreaks of the disease also occur in new plant beds when spores are blown into them from diseased plants in old nearby beds.

The disease is most destructive during cool, damp weather, and is present on cabbage in Florida from September to the following May. It develops rapidly when night temperatures range between 50° and 60°F. for 4 or more nights in succession and the plants remain wet until 10 to 11 o'clock in the mornings. Under such conditions the fungus may complete its life cycle and produce spores on leaves within 2 or 3 days after they are

infected. When heavy dews occur on several successive nights and the days are dry and sunny, the disease kills many plants in the seed-leaf stage and retards the growth of others. The fungus is inactive during cold weather when night temperatures go below 40°F.

SYMPTOMS

Downy mildew first appears on the seed leaves if the seedlings emerge when conditions are favorable for the disease. It can be recognized easily in the morning, when the plants are wet with dew, by the presence of a white mold consisting of mycelium, spore-bearing structures, and masses of spores of the fungus on the lower sides of infected leaves and sometimes on their upper surfaces. The mold also may appear on petioles and stems of young seedlings. After the dew disappears from the leaves during the day the fungus withers and cannot be seen distinctly with the unaided eye. A diseased leaf fades to a pale green and yellow and finally turns brown as it dies. Young seedlings perish when their seed-leaves are killed before they have formed true leaves.

The first symptoms of the disease on large true leaves consists of scattered pale green spots about 1/32 inch in diameter. New spots appear each day and the old ones grow larger, turn yellow and then brown until most of the leaf is involved. New leaves become infected successively as they appear and the old ones which have been killed by the disease are shed.

Mildew never disappears from affected plants after they are set in the field, and healthy plants may become infected after they are transplanted. As the plants grow and mature the lower leaves frequently become severely spotted with mildew. Spots may appear also on the outside head leaves and impair the appearance and market value of the head. Furthermore, secondary organisms may enter diseased tissues of the head leaves and cause a soft decay of the heads in the field during wet weather, or during shipment to market if the cabbage has been cut and packed while wet.

CONTROL

Downy mildew can be controlled in the plant bed by spraying the plants with spergon spray prepared by mixing 4 pounds of wettable spergon with 100 gallons of water, or by dusting the plants with 12 percent spergon dust. Fermate, zerlate, dithane, bismuth subsalicylate, zinc ethylene bis-dithiocarbamate, man-

ganese ethylene bis-dithiocarbamate, sulfur, and copper-containing fungicides have been tested during the last 5 years, but none has proved as effective as spergon for controlling mildew.

Spraying and Dusting Equipment. — Sprayers which deliver at least 300 pounds pressure at the nozzle with 2 nozzles for each row of plants are recommended for applying the spray. Openings in nozzle disks should be 2/64 inch in diameter to make a fine spray. Use a row-crop sprayer to spray narrow beds. When plants are grown in wide beds which cannot be sprayed with a row-crop sprayer, use a tractor-operated or an engine-driven sprayer equipped with a suitable length of high pressure hose and an extension rod with cut-off at one end and nozzles mounted at the other end.

Dust is applied best with a tractor-operated duster equipped with a 4- to 6-row boom having 1 nozzle for each row of plants.

Hand-operated sprayers and dusters should be used only in gardens or other places where the plant beds are too small to permit the use of larger machines.

Applying the Dust and Spray. — For satisfactory control of downy mildew the first application of spray or dust must be made before the disease appears in the bed. The first application may be made a week to 10 days after the seed are planted, or later, depending on weather conditions. Plants should be treated 3 times each week, with a 1- to 2-day interval between treatments; except during cold weather when night temperatures drop below 40°F., when 2 treatments per week are sufficient. It is also necessary to spray or dust plants after each rain or after irrigation with sprinklers because water washes off the spergon and exposes the plants to infection.

Approximate quantities of spergon dust or spray to use at each application to control mildew on plants of different stages of growth when they are grown in narrow plant beds (2- to 3-row beds, 40 to 42 inches apart) and in beds 1 yard wide are as follows:

Plant Height	Narrow Beds		Wide Beds	
	Dust Pounds per Acre	Spray Gallons per Acre	Dust Pounds per 100 Sq. Yds.	Spray Gallons per 100 Sq. Yds.
Less than 2 inches ..	10 to 15	50 to 60	$\frac{3}{4}$ to 1	5 to 6
2 to 4 inches	15 to 20	60 to 100	1 to 2	6 to 10
4 to 8 inches	20 to 30	100 to 150	2 to 3	10 to 15

Precautions. — Do not use more spergon spray or dust on plants less than 2 inches high than is recommended, since heavier applications may injure or kill them. Larger plants can withstand heavier dosages than those recommended, but excessive use of spergon will not give any better control of mildew and will increase the cost of treatment.

An operator of a duster should wear a respirator when it is needed to avoid inhalation of the fungicide.

DDT Can Be Used With Spergon. — Most insects which attack cabbage, with the exception of aphids, can be controlled by treating the plants with a regular DDT dust or spray, with spergon dust containing 3 percent DDT, or with spergon spray containing 1 pound of actual DDT in each 100 gallons of spray. Three treatments with DDT-spergon dust or spray are recommended: the first when the plants are up to a stand; the second at about the middle of the plant-growing period; and the final one immediately before the plants are pulled for setting in the field. On days when plants are treated with DDT-spergon dust or spray no additional treatments with spergon alone are needed for controlling mildew.

Cost and Advantages. — Plants seldom have to be sprayed or dusted with spergon as many as 15 times before they are large enough for setting in the field. The cost of materials and labor for treating an acre of plants is about \$5 per application, or \$75 for 15 applications, and when fewer treatments are made the cost will be proportionately less. Tests have shown that it is possible to grow 75 to 650 thousand more plants per acre in spergon-treated plant beds than in non-treated beds, depending upon the severity of mildew. Furthermore, when spergon-treated plants are ready for transplanting they are usually twice the size of non-treated, diseased plants of the same age, and they grow more rapidly after they are set in the field.